

## GROUNDWATER MANAGEMENT IN ARID AND SEMI-ARID REGIONS: CHALLENGES AND OPPORTUNITIES

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Groundwater often represents the main source of fresh water supply for domestic and agricultural needs in areas characterized by limited surface water resources and low precipitation rates, like coastal zones in Southern Europe and in the Middle East and North Africa (MENA) Region.

These areas are being increasingly characterized by rapid population growth, also due to internal migration towards the most productive coastal regions, and tourism activities, thus resulting in a severe rise of water needs and consumption. Indeed, physical water scarcity is becoming a major concern in both urban and rural zones along the Mediterranean basin, where there is often not enough water to meet all demands, including environmental flows. In these situations, groundwater is intensively used for irrigation, industrial and domestic consumption, and consequently, due to the lack of adequate control, intensive abstraction can lead to aquifer overexploitation, and subsequent water table lowering.

In addition, in these regions (like in many aquifers worldwide), groundwater quality degradation is also threatening the natural aquifer characteristics, and the associated wellbeing of local populations and dependent natural ecosystems. In this regard, aquifer salinization (mainly associated –but not exclusively due– to sea water intrusion) and pollution (caused by intensive anthropogenic activities and by the lack of adequate control of sewage and waste disposal) are generally identified as the main issues to be addressed.

Indeed, unregulated abstraction and uncontrolled contaminant loads (e.g. unconfined septic tanks, lack of adequate sanitation facilities, excessive use of fertilizers and pesticides) are severely endangering already scarce groundwater resources, while the combined impact of all these processes acts synergically towards an increase in groundwater mineralization, hence affecting aquifers' quality and their potential suitability for current and future uses.

Understanding the main causes of groundwater contamination and salinization, together with a more effective control on groundwater abstraction, is of paramount importance in order to ensure adequate water quality protection measures, and to avoid potential health and food security issues. The unequivocal identification of contamination sources is therefore a fundamental step for the correct long-term aquifer protection, especially in arid and semiarid regions, where the sustainable management of water resources is a permanent challenge, due to the increasing demand combined to the negative impacts of climate changes. Nevertheless, the crucial role of science in supporting effective management practices must also be considered in this process, while also assessing the real needs of the populations relying on groundwater resources. For this reason, it is of paramount importance to identify the best approaches to foster the connections among scientists (and more generally water professionals) and all the relevant stakeholders (including water end-users and marginal groups), and to reach new –shared and

science-based– groundwater management strategies.

This presentation will discuss the main issues relative to groundwater resources management in arid and semi arid regions, with a particular focus on developing countries and examples from Morocco, Tunisia and Senegal. In addition, the role of hydrogeologists as advocates for public engagement in water governance, and the potentialities of the socio-hydrogeological approach to contribute bridging the gap between science and society will be presented.

